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## Introduction

Within the Life+ project WoodRub, AUTH-LFU investigated the manufacturing and testing of gypsum bonded solid bricks with wood chips from particleboard production residues and rubber from waste tires.

The design of WoodRub BRICKS for the purpose of the selected application (internal insulation wall) refers to a standard dimensioned brick of 8.5 × 5.5 × 18.5 cm (W × H × L) with 6 holes.

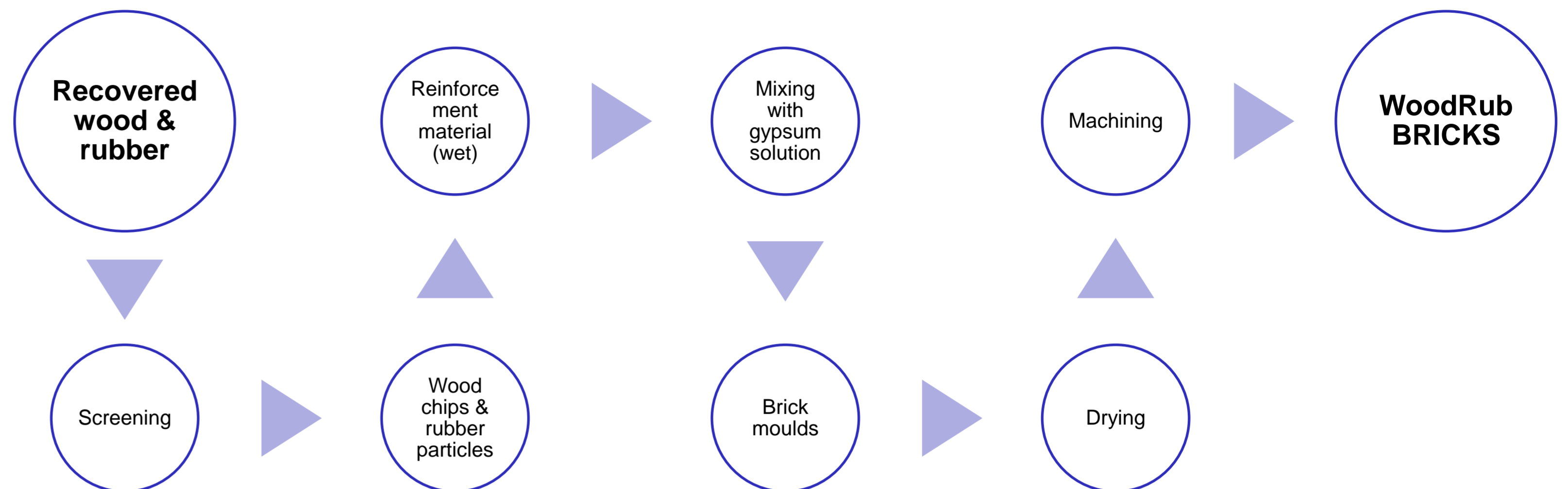
## Materials

1. Medium-sized fraction of wood chips from particleboard production residues provided by Glunz AG, Germany: 1-2 mm
2. Large fraction of rubber from waste tires provided by Keridis Christoforos SA, Greece: 2-4 mm
3. Reinforcement material (reduced rubber material containing textiles) provided by Keridis Christoforos SA: 4 mm < rubber-textile material
4. Gypsum
5. Water

WoodRub BRICKS provide utilisation opportunities for the rubber-textile material, which actually is a waste in the tire recovery process and has no other use at the moment.

The recovered materials (rubber, wood) as well as the reinforcement material (rubber-textile) were fully mixed up in a 1:1.5 gypsum-water solution in proportions per weight: 70 % gypsum solution, 15% wood chips, 10% rubber particles, 5% rubber-textile (Fig. 1).

## Manufacturing line



## Properties

Properties				Comments
Density, Kg/m <sup>3</sup>	Compressive strength, N/mm <sup>2</sup>	Thermal conductivity, W/mK	Sound absorption coefficient	
580	Lateral upper side at the large surface 8.5 × 8.5 cm: 0.57 Lateral upper side at the small surface 5.5 × 8.5 cm: 0.51 Axial at the surface 5.5 × 8.5 cm: 1.09	0.274	1,000 Hz: 0.72 2,000 Hz: 0.43 4,000Hz: 0.45	Class emission for volatile organic compounds, EN ISO 16000-9 (2006): A

## Static calculations for internal wall constructions

Two different construction techniques were considered:

- a. 3 m internal wall with bricks put with their small surface

In this case, a 3 m high wall requires 35 bricks for a single row from the floor to the top. Each brick is able to bear around 5,088 N or 518.13 Kg or 0.500 N/mm<sup>2</sup>. It is more than enough as the 35 bricks weight around 17.5 Kg (the weight of one brick is around 0.5 Kg), so their load is 171.62 N or 0.0169 N/mm<sup>2</sup>.

- b. 3 m internal wall with bricks put with their large surface

In this case, a 3 m high wall requires 55 bricks for a single row from the floor to the top. Each brick is able to bear around 8,932 N or 910.81 Kg or 0.568 N/mm<sup>2</sup>. It is more than enough as the 55 bricks weight around 27.5 Kg (the weight of one brick is around 0.5 Kg), so their load is 269.68 N or 0.0172 N/mm<sup>2</sup>.

## Design of internal walls with WoodRub BRICKS



## Acknowledgements

The research has been funded by the European project LIFE09 ENV/ES/000454 WoodRub “Utilisation of recovered wood and rubber for alternative composite products”.



Figure 1. . Water (A), gypsum (B), recovered wood (C) and rubber fractions (D), and reinforcement material (E) for the manufacturing of WoodRub BRICKS (up left) by using simple moulds (up right)